

Abstract

The present research had dealt with preparation of bars with length of about(13cm)and adiameter of(1.5cm)of composite materisl with metal matrix represented by(Al-Cu-Mg) cast reinforced by (ZrO_2) or (Al_2O_3) particles with choosen weight percentages (1,3,4.5.6%).

The matrix alloy and the composite materials were prepared by casting methode and using vortex technique in order to disperse reinforced particles in homogeneous way on the matrix alloy floor. In addition to that, two main groups of composite materials were prepared depending on the type of reinforced materials, the first group included composite material reinforced by (ZrO_2) particles represented by the particles size ($25\mu m \geq p.size \geq 0.05\mu m$) while the second group included composite material reinforced by(Al_2O_3) particles represented by the particles size($30\mu m \geq p.size \geq 0.1\mu m$).

Concerning tests that were made for the prepared models, they included tensile test , fatigue and hardness test and microscopic in addition to x-ray diffraction examination in order to know the sedimented phases due to insolutio or aging heat treatments or phases resulting from the process of dispersion reinforced particles at matrix alloy floor.

The study contained the effect of solution heat treatment at($495C^\circ$) for(4hr) and the following forming process in addition to double aging process were made for the prepared models of hardness test and included the aging at ($150C^\circ$) for(2hr) and then aging at($170C^\circ$) during different periods as well as studying the effect of reinforcing matrix alloy with reinforced particles on some of its mechanical properties. The microscopic examination showed that the microscopic structure of the composite material has finer particles than that of the matrix alloy, The distributon of reinforced particles was nearly homogeneous at matrix alloy floor and boundary cristilization.

Results of Fatigue test and hardness test showed an increase in fatigue resistance and hardness in addition to the increase in reinforced particles that were added, but staying at higher values than that in the matrix alloy.

The effect of type for reinforced particles on the mechanical properties was noted. There was a specified increase in fatigue resistance and hardness of composite material reinforced by(Al_2O_3) particles in comparasion with that reinforced by(ZrO_2) particles. Their values were more than in the matrix alloy.

The x-ray diffraction for the prepared models(and Heat Treatment) showed sedimenting of the solid phase(CuAl_2) in both matrix alloy and composite materials that was reinforced with chosen percentages of(ZrO_2) and(Al_2O_3) particles, in addition to the presence of medium phases that would make on evidence of the reaction of cast elements presents in the matrix alloy with aluminium, in addition to the appearance of another phases that concern reinforced materials(ZrO_2 & Al_2O_3).